Remarks

Claims 1, 3-11, 13-21, 23-54, and 56-58 are pending in the subject application. Accordingly, claims 1, 3-11, 13-21, 23-54, and 56-58 are currently before the Examiner for his consideration. Favorable consideration of the claims now presented, in view of the remarks and amendments set forth herein, is earnestly solicited.

Claims 3, 6, 13, 16, 23, 26, and 56-58 have been objected to under 37 C.F.R. § 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant respectfully traverses this objection. In particular, as the Office Action points out, the independent claims 1, 11, and 21 incorporate the limitation "wherein each of the at least one measure of vocal quality are selected from the group consisting of roughness, hoarseness, strain, and breathiness." In other words, the at least one measure vocal quality are selected from the group consisting of the four different measures, which are roughness, hoarseness, strain, and breathiness, which means claims 1, 11, and 21 are directed to embodiments where the at least one measure of vocal quality can be any one, two, or three of the four measures of voice quality listed in the group, or can be all four of the measures of voice quality listed in the group. In contrast, the dependent claims 3, 6, 13, 16, 23, 26, and 56-68 limit the possible measures of voice quality that the at least one measure of voice quality can be, as compared to the possible measures of voice quality specified in the independent claims 1, 11, and 21. For example, claim 3 includes the limitation "wherein said at least one measure of vocal quality is at least one of roughness and hoarseness." Accordingly, the limitation in claim 3 only allows the at least one measure of voice quality to be roughness, to be hoarseness, or to be roughness and hoarseness. In particular, claim 3 does not cover embodiments where the at least one measure of voice quality is strain, is breathiness, or is strain and breathiness, all three of which are covered by claim 1. Analogously, the limitations in claims 6, 13, 16, 23, 26, and 56-58 also further limit the group as specified in the independent claims 1, 11, 21. Accordingly, Applicant respectfully requests withdrawal of the objection of claims 3, 6, 13, 16, 23, 26, and 56-58 under 37 C.F.R. § 1.75(c).

Claims 1, 3-5, 11, 13-15, 21, 23-25, and 31-51 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Bayya *et al.* (U.S. Patent No. 6,446,038; hereinafter "Bayya") in view

of Treurniet *et al.* (U.S. Patent No. 7,164,771; hereinafter "Treurniet"), and in further view of Deal *et al.* ("Some Waveform and Spectral Features of Vowel Roughness"; hereinafter "Deal"). The applicant respectfully traverses this grounds for rejection as a *prima facie* case of obviousness has not been presented.

The Office Action at page 5-6 states

> "Bayya teaches a method of diagnosing voices comprising processing a voice signal . . .; identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals **18** representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized . . .; comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of the voice signal (see Bayya, columns 3-4, equations 1-6 and see col. 4, lines 53-59, where the speech quality is evaluated in several dimensions including naturalness)."

The applicant disagrees. First, Bayya does not teach a method of diagnosing voices, but, rather, teaches a method for evaluating the quality of speech in a voice communication system.

Further, Bayya does not process a voice signal. Once the corrupted speech signal **14** is received, the corrupted speech signal **14** is not processed, but, rather, the corrupted speech signal **14** is input into the first processor **12** (col. 2, line 52), so that the first processor can determine an amount of distortion present in the corrupted speech signal **14** (col. 3, lines 16-18).

Still further, Bayya does not identify one or more voice quality attributes of said voice signal by analyzing said processed voice signal. Rather, as cited in the Office Action, Bayya "generates corresponding signal **10** representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measures utilized. Such distortion has nothing to do with the voice quality attributes of the voice signal, but, instead, is a measure of the distortion introduced by the communication system.

Further, Bayya does not teach comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes in order to determine at least one measure of vocal quality of the voice quality. Rather, Bayya compares the corrupted speech signal **14** to speech reference vectors **16**, where the reference vectors **16** are obtained from a large number of clean speech samples obtained by recording speech over cellular channels in a quiet environment (see col. 2, lines 57-58), in order to determine distortion in the corrupted speech signal caused by the communication system. As taught at col. 3, lines 21-23, the output of the comparison of the corrupted speech signal to the reference vector in Bayya is a corresponding signal **18** representing the amount of distortion in the corrupted speech signal. This distortion is caused by the communication system. Accordingly, Bayya does not teach or suggest diagnosing the speech signal prior to being sent over the communication system to diagnose the voice. In fact, presumably, if the speech signal was analyzed by Bayya prior to being sent over the communication system, very little distortion would be identified and there would be no point to making the analysis.

At page 6, the Office Action concedes that neither Bayya nor Treurniet disclose determining at least one measure of vocal quality selected from the group consisting of roughness, hoarseness, strain, and breathiness. Page 7 of the Office Action asserts that "Deal teaches a measure of voice quality that is at least one of roughness and hoarseness" and that it would have been obvious to use the measurement method of Deal as one of distortion measures of Bayya in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal. However, Applicant asserts that there would have been no suggestion or motivation for Bayya in view of Treurniet to combine with the roughness measure taught by Deal to evaluate a speaker's vocal quality itself as one of distortion measures, when Bayya in view of Treurniet are interested in measuring the quality of the corrupted speech in a voice communication system (see col. 2, lines 54-60, col. 5, lines 48-49, and the preamble of claim 1 of Bayya).

In addition, the Office Action, at page 7, states "Deal discloses a method of measuring vocal roughness" (underline added for emphasis). However, claims 6, 16, and 26 include the limitation "wherein said at least one measure of vocal quality is breathiness", claims 7-10 depend

from claim 6, claims 17-20 depend from claim 16, and claims 27-30 depend from claim 26. Further, claims 56-58 include the limitation "wherein the at least one measure of vocal quality is strain". Accordingly, the cited references do not teach all of the elements of claims 6-10, 16-20, 26-30, and 56-58. Further, regarding claims 3-5, 13-15, and 23-25, Applicant asserts that Deal does not teach the voice quality attributes as specified in claims 3-5, 13-15, and 23-25. Rather, Deal teaches jitter, shimmer, spectral noise level, and combination of jitter, shimmer, and spectral noise level as voice quality attributes to be associated with vowel roughness (page 251, 4th paragraph of Deal). Accordingly, the cited references do not teach all of the elements of claims 3-5, 13-15, and 23-25.

It appears that, since Bayya did not teach or suggest determining a measure of voice quality selected from the group consisting of roughness, hoarseness, strain, and breathiness, a search was done for a reference citing one of these terms, and Deal turned up. The Office Action does not provide any explanation for why Bayya would be motivated to incorporate any aspect of the teachings of the Deal reference or how any such aspect would be incorporated into the Bayya system. In order for Deal to determine any sort of an analysis of roughness, Deal teaches investigating acoustic wave-period variation (jitter) and acoustic wave-amplitude variation (shimmer) associated with vowel phonations (see abstract). There is no indication provided by the Office Action as to how such investigations would help Bayya measure distortion introduced by the communication system. Further, at page 252, Deal teaches that "subjects individually sustained each of five test vowels ... for 7 sec". There is no indication in the Bayya reference that Bayya had any control of the original recorded speech signal, but appeared to just receive the corrupted speech signal that has been sent over the communication system. Further, on p. 260-261, Deal states "[b]ecause the PVI associated with the simulated rough and clinically hoarse vowel phonations ... the clinical usefulness ... may be limited ... not sufficiently large to be clinically predictive ... period variability is only incidentally related to the perceived roughness of vowels". On page 261, Deal states "[b]ecause the AVI ... not always significantly larger ... the implied constraints regarding clinical usefulness of such measures thus seem similar to those associated with PVI measures ... not large enough to be clinically predictive." Finally, at page 262-263, Deal

states "...spectral noise may provide a more clinically useful indicant of roughness than the filtered wave variability indices employed **in this study**". Accordingly, it is not clear what exactly would be combined with the teaching of Bayya in accordance with the combination referred to by the Office Action.

Claims 1, 11, and 21 each incorporate the limitations of "processing a voice signal using an auditory model to produce a processed voice signal, identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal, and comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes in order to determine at least one measure of the voice signal". At page 6, the Office Action concedes Bayya does **not** use an auditory model, but asserts that it would have been obvious to modify Bayya to include this feature for the purpose of better estimating how the signal will be perceived. The applicant asserts there would have been no motivation for Bayya *et al.* to process a voice signal using an auditory model as Bayya is interested in measuring how speech is corrupted in a communication system.

Further, Bayya *et al.* does not teach "identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal, and comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes in order to determine at least one measure of the voice signal". Rather, Bayya *et al.* "determines an amount of distortion present in the corrupted speech signal according to a plurality of distortion measures based on the set of speech reference vectors **16** (see col. 3, lines 17-23 and Figure 1). In this way, Bayya compares the corrupted speech signal **14** to speech reference vectors **16**, where the reference vectors **16** are obtained from a large number of clean speech samples obtained by recording speech over cellular channels in a quiet environment (see col. 2, lines 57-58), in order to determine distortion in the corrupted speech signal caused by the communication system. As taught at col. 3, lines 21-23, the output of the comparison of the corrupted speech signal to the reference vector in Bayya is a corresponding signal **18** representing the amount of distortion in the corrupted speech signal. This distortion is caused by the communication system.

This is very different from the claimed invention of claims 1, 11, and 21, where the voice signal being diagnosed need not have passed through a communication system, (although the voice signal may have), but can be any voice signal. Further, with respect to the claimed embodiments of claims 1, 11, and 21, the voice signal is not compared to reference vectors as in Bayya *et al.*, but, rather, is processed using an auditory model to produce a processed voice signal, and then the processed voice signal is analyzed to identify one or more voice quality attributes. The one or more voice quality attributes are then compared to one or more baseline vocal quality attributes in order to determine at least one measure of vocal quality of the voice signal.

On page 6, 1st full paragraph, of the Office Action, in regard to the limitation "comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values ... in order to determine at least one objective measure of vocal quality of the voice signal" the Office Action refers to col. 3, lines 1-8 and equation 6 of Bayya and states, "using these cepstral values to determine a distortion measure". However, the embodiments of the subject invention as claimed in claims 1, 11, and 21, involve "identifying one or more voice quality attributes and then comparing the one or more voice quality attributes with the one or more baseline vocal quality attributes". In contrast, Bayya teaches that the reference vectors are compared with a corrupted speech signal to get the corresponding signals **18** representing the distortion in the corrupted speech signal. The measured distortion signals **18** are then "processed by the neural network **22**" (see col. 5, lines 28-34) to "determine the quality of the speech".

On page 3, the Office Action states "the Examiner notes that claims broadly recite voice quality attributes being compared". This is not true. Claims 1, 11, and 21 do not involve comparing voice quality attributes. Rather, one or more voice quality attributes are compared with one or more baseline vocal attributes, resulting in at least one measure of vocal quality of the voice signal, where the at least one measure of voice quality is limited to roughness, hoarseness, strain, and/or breathiness. For contrast, Bayya involves (see col. 3, lines 16-20) inputting the corrupted speech signal **14** to the first processor and determining an amount of distortion according to a plurality of distortion measures based on the set of speech reference vectors **16**, where this

distortion is NOT roughness, hoarseness, strain and/or breathiness. The Office Action further states the "[a]pplicants note that the voice signal does not have to pass through a communication system but can ... [i]t is unclear as to how Bayya is different since the signal can be any voice signal". This misses a key difference between the embodiments claimed in claims 1, 11 and 21 and Bayya. Claims 1 11, and 21 determine at least one measure of voice quality of a voice signal, without regard as to whether the voice signal went through a communication system. So, valuable information is provided either way, and the embodiments of claims 1, 11, and 21 would have no way of determining what effect the communication system had if the voice signal had gone through a communication system. In contrast, the principal purpose of the Bayya system is to determine the distortion caused by the communication system. If the speech sample did not go through a communication system, there would be no use to putting the speech sample into the Bayya system. Likewise, the Bayya system does not measure any measure of voice quality of a voice signal, but, rather, measures distortion caused by a communication system. To use the Bayya system on a speech sample that did not go through a communication system would defeat the principal purpose of the Bayya system.

The Office Action, at page 4, states "the claims at present do not exclude such an interpretation as the claims recite 'identifying one or more attributes ... of said voice signal'", in order to apparently argue that the distortion determined by Bayya would meet the limitation of identifying one or more voice quality attributes. However, claims 1, 11, and 21 also include "comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes in order to determine at least one measure of vocal quality of the voice signal, wherein each of the at least one measure of voice quality are selected from the group consisting of roughness, hoarseness, strain, and breathiness. There is no indication, nor does the Office Action provide any explanation, that the distortion determined by Bayya could be compared to anything, such as baseline vocal quality attributes, in order to determine roughness, hoarseness, strain, and breathiness.

Further, Bayya teaches the cepstral coefficient vectors are extracted from the reference vectors, where the reference vectors **16** are obtained from a large number of clean speech samples

recorded over cellular channels in a quiet environment (see col. 2, lines 57-60), in order to determine distortion in the corrupted speech **caused** by a communication channel. The reference vectors **16** of Bayya representing uncorrupted clean speech are necessary to evaluate a communication channel since input speech signal is **not** available in an output-based objective measure (see col. 2, lines 55-56). Accordingly, "quality of the speech" as used in Bayya is quite different than "voice quality" as used in claims 1, 11, and 21. Applicant respectfully asserts that Bayya fails to disclose each of the above-described features.

Furthermore, the applicant asserts that there would have been no motivation for Bayya to process a voice signal using the peripheral ear model of Treurniet ("auditory model") as Bayya is interested in measuring how speech is corrupted in the speech communication system (see col. 2, lines 54-60, col. 5, lines 48-49, and the preamble of claim 1 of Bayya).

At page 3 of the Office Action, the Examiner states "[s]ufficient motivation is present in combining the teachings of Treurniet with the teachings of Bayya ... [t]he auditory model of Treurniet provides an improvement upon Bayya, where Treurniet enables the perceptual quality of an audio or speech sequence to be obtained...". However, the Bayya system is for measuring distortion caused, in a corrupted speech signal, by a communication system. The Bayya system is designed for situations where there is no access to the original speech signal (if you had the original signal you could just compare the corrupted signal to the original signal). Therefore, there would be no motivation to process the corrupted speech signal in Bayya with an auditory model, because it would be like comparing apples to oranges as it is not possible to process the original speech signal with an auditory model so that similarly processed speech signals could be processed. Rather, Bayya wants the only difference between the original speech signal and the corrupted speech signal to be the distortion added by the communication system, not any further "distortions" added to the corrupted speech signal as compared to the original speech signal, as Bayya is evaluating the distortion introduced by the communication system. Accordingly, processing the corrupted speech signal with an auditory model would cause the Bayya system to produce a less accurate evaluation of the distortion introduced by the communication system.

Accordingly, applicant asserts that there is no teaching, suggestion or motivation to modify the teachings of Bayya, or to combine the teachings of Bayya, Treurniet, and Deal, to arrive at the subject invention as claimed in claims 1, 11, and 21. Specifically, Deal does not cure the deficiencies of Bayya and Treurniet with respect to the rejection of claims 1, 11, and 21. The applicant submits that Bayya, Treurniet, and Deal, alone or in combination, do not teach or suggest the subject invention as claimed in claims 1, 3-5, 11, 13-15, 21, 23-25, and 31-54. Accordingly, the applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1, 3-5, 11, 13-15, 21, 23-25, and 31-54 under 35 U.S.C. §103(a).

Claims 6-10, 16-20, and 26-30 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Bayya in view of Treurniet, in view of Deal and in further view of Hillenbrand *et al.* ("Acoustic Correlates of Breathy Vocal Quality"; hereinafter "Hillenbrand"). The deficiencies of Bayya and Treurniet with respect to the rejection of claims 1, 11, and 21 have been discussed above, and Deal and Hillenbrand do not cure such defects. The applicant submits that Bayya, Treurniet, Deal, and Hillenbrand, alone or in combination, do not teach or suggest the subject invention as claimed in claims 6-10, 16-20, and 26-30. Accordingly, the applicant respectfully requests reconsideration and withdrawal of the rejection of claims 6-10, 16-20, and 26-30 under 35 U.S.C. §103(a).

Claims 56-58 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Bayya in view of Treurniet, in view of Deal and in further view of Hadjitodorov *et al.* ("A Computer System for Acoustic Analysis of Pathological Voices and Laryngeal Disease Screening"; hereinafter "Hadjitodorov"). The deficiencies of Bayya and Treurniet with respect to the rejection of claims 1, 11, and 21 have been discussed above, and Deal and Hadjitodorov do not cure such defects. The applicant submits that Bayya, Treurniet, Deal, and Hadjitodorov, alone or in combination, do not teach or suggest the subject invention as claimed in claims 56-58. Accordingly, the applicant respectfully requests reconsideration and withdrawal of the rejection of claims 56-58 under 35 U.S.C. §103(a).

In view of the foregoing remarks and amendments to the claims, applicant believes that the currently pending claims are in condition for allowance, and such action is respectfully requested.

The applicant also invites the Examiner to eall the undersigned if clarification is needed on any of this response.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 or 1.17 as required by this paper to Deposit Account 19-0065.

Respectfully submitted,

James S. Parker
Patent Attorney
Registration No. 40,119
Phone No.: 352-375-8100
Fax No.: 352-372-5800
Address: Saliwanchik, Lloyd & Saliwanchik
A Professional Assoeiation
P.O. Box 142950
Gainesville, FL 32614-2950

JSP/das